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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/882,141 | 06/15/2001 | Yiqiong Wang | AM1562D1 | 8856 |

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EXAMINER

UMEZ ERONINI, LYNETTE T

ART UNIT

PAPER NUMBER

1765

8

DATE MAILED: 05/15/2002

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/882,141

Applicant(s)

WANG ET AL.4

Examiner

Lynette T. Umez-Eronini

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-6 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 4 is/are allowed.
- 6) ☒ Claim(s) 1-3, 5 and 6 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on ____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. ____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) ____.
- 4) ☒ Interview Summary (PTO-413) Paper No(s). 7.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1-3 are rejected under 35 U.S.C. 102(b) as anticipated by or, in the alternative, under 35 U.S.C. 103(a) as obvious over Komura et al. (US 5,423,941) in view of Harshbarger et al (US 4,208,241).

In claim 1, lines 1-2, "for a silicon substrate connected to a low power bias source" is not given patentable weight because the claim recites functional language which tells intended use of rather than describe the invention.

Komura teaches etching a silicon semiconductor substrate with an etchant gas mixture comprising HBr, SiF₄, He, O₂, and SF₆ (Figure 1A; column 4 line 23-27; column 6, lines 49-52, 63-66; Tables 1, 2, 3, and 6; Figure 3; and column 4, lines 8-24).

Komura differs only in failing to teach an anisotropic etch mixture.

Harshbarger teaches anisotropic etching refers to etching resulting in an essentially flat, vertical etch wall on a plane approximately that of the initial resist edge prior to etching (column 4, lines 49-57), which is similar to Komura's trench in Fig 1A.

Komura's etchant mixture provides a trench with a good configuration preserving a slight taper of trench side wall at an angle near 90° (column 2, lines 30-34, 52-57;

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Tables 1, 2 and 6; and Figure 1A). Since Komura's etchant mixture etches silicon to form a structure which has characteristics of an anisotropic etch as taught by Harshbarger, then it is the examiner's position that one having ordinary skill in the art at the time of the claimed invention would have found that using Komura's etchant mixture would result in an anisotropic etch mixture consisting of at least one of the fluorine-containing gases selected from the group consisting of SF₆, Si₂F₆, and SiF₄; HBr and oxygen, as the claimed invention for the purpose of forming a trench having a good configuration.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Komura '941) as applied to claim 1 above.

Komura differs only in failing to specify recited processing variables such as the volume ratio of HBr:SF₆ of 0.1 to 10, **in claim 5** and HBr and SF₆:O₂ of 0.1 to 10, **in claim 6**.

It would have been obvious to one having ordinary skill in the art at the time of the claimed invention to employ any of a variety of processing variables such as those

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claimed by the applicant. They are well-known variables in the etching art and known to affect both the rate and quality of the etching process. Conducting routine experimentation for the purpose of obtaining the best-etched product would optimize the selection of a particular value. Changes in temperature, concentrations, or other process conditions of an old process do not impart patentability unless the recited ranges are critical, i.e., they produce a new and unexpected result. *In re Aller et al.*, 105 USPQ 233.

Allowable Subject Matter

5. Claim 4 is allowed. The following is a statement of reasons for the indication of allowable subject matter: Prior art fails to teach an etch mixture consisting essentially of a fluorine-containing gas that includes Si_2F_6 along with SF_6 and SiF_4 ; and HBr and oxygen.

Conclusion

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

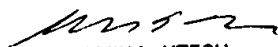
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

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shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lynette T. Umez-Eronini whose telephone number is 703-306-9074. The examiner can normally be reached on Second Friday.

ltue
May 10, 2002


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